

A new species of *Apogon* (Perciformes: Apogonidae) from the Saya de Malha Bank, Indian Ocean, with redescriptions of *Apogon regani* Whitley, 1951, *A. gardineri* Regan, 1908, and *A. heraldi* (Herre, 1943).

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Abstract.—A new species of fish, *Apogon quartus*, known only from the Mascarene Plateau, is described. It is related to *Apogon poecilopterus* Cuvier in Cuvier and Valenciennes, 1828, *Apogon carinatus* Cuvier in Cuvier & Valenciennes, 1828, and *Apogon queketti* Gilchrist, 1903, recently treated by Gon (1996) as members of the subgenus *Jaydia* Smith, 1961. *Apogon quartus* can be distinguished from these three species by having a single predorsal scale, 18 total (13 well developed) gill rakers on the first arch, and a single dark spot, perhaps appearing as an ocellus in life, on the body just behind the opercle flap. Six additional nominal species are added to the 10 valid (19 nominal) species treated by Gon in *Jaydia*. Three of these names, *Apogon argyrogaster* Weber, 1909, formerly in *Siphamia*, *Apogon melanopus* Weber, 1911, and *Apogon fuscomaculatus* Allen & Morrison, 1996, are valid species. The holotype of *Apogon heraldi* (Herre, 1943) redescribed here, is a synonym of *A. poecilopterus*. *Apogon fuscovatus* Allen, 1985 was determined to be a synonym of *A. melanopus* by Allen & Morrison (1996) The other name, *Apogon tchefouensis* Fang, 1942, may be synonymous with one of the species Gon treated but is not placed with certainty. Character overlaps between the subgenus *Jaydia* and other *Apogon* subgenera, particularly the largest subgenus *Ostorhinchus* Lacépède, 1802, are briefly examined. Virtually all derived characters of *Jaydia* grade into *Ostorhinchus*. Two rare species *Apogon regani* Whitley, 1951 and *Apogon gardineri* Regan, 1908 only known from the Mascarene Plateau are redescribed from new material. Both belong with the *Apogon nigripinnis* Cuvier in Cuvier and Valenciennes, 1828, complex of species.

The Russian vessel *Vityaz* made trawl stations along the Saya de Malha Bank during 1989 collecting fishes. Two of these collections contained a new species and a specimen of *Apogon regani* Whitley, 1951. The new species was first identified as an *Apogonichthys* Bleeker, 1854c, based on the mostly smooth preopercle edge and the slightly rounded caudal fin. An examination of internal and external characteristics led to the conclusion that this specimen is an *Apogon* Lacépède, 1802. Some characters are held in common with species in the sub-

genus *Jaydia* recently treated by Gon (1996). The ten species of *Jaydia* have the fourth dorsal spine longer than any other dorsal spine, variable serrations on preopercular edges, rounded or truncated caudal fins, and some have bioluminescent organs. Gon and Allen (1998) included another new species, *Apogon photogaster* in *Jaydia*. A review of additional nominal species with possible relationships to the new species yielded six names, *Apogon argyrogaster* Weber, 1909, (previously in *Siphamia* Weber, 1909, see Lachner 1953, p.

416), *Apogon melanopus* Weber, 1911, *Apogon tchefouensis* Fang, 1942, *Apogon heraldi* (Herre, 1943), *Apogon fuscovatus* Allen, 1985 and *Apogon fuscomaculatus* Allen & Morrison, 1996.

Specimens of all the above species have been most frequently taken by trawls, often in deeper waters. Fishes in *Jaydia* have body shapes ranging from elongate more slender forms, *Apogon truncatus* Bleeker, 1854e, to *A. melanopus* a deeper body form with an emarginate caudal fin typical of most *Apogon*. Smith (1961) based *Jaydia* on *Apogon ellioti* Day, 1875, now recognized as a synonym of *A. truncatus* a slender species with a rounded caudal fin and having bioluminescent activity.

In the process of trying to locate more material of the new species, specimens of two deep-dwelling species from the Nazareth Bank near Cargados Carajos Shoals (St. Brandon) described by Regan (1908) were found. Randall and van Egmond (1994) reported *Apogon punctatus* Regan, 1908, (= *Apogon regani* Whitley, 1951) taken in a trawl from the Seychelles. No material of *Apogon gardineri* Regan, 1908, has been reported since the original description, but deep dives by J. E. Randall during 1979 in Mauritius yielded two specimens. It is likely that more material will be only slowly forthcoming. Both of these species are regarded as endemics of the Mascarene Plateau.

Methods

Methods of taking and recording meristic data and measurements are given in Fraser & Lachner (1985). All measurements are in millimeters to the nearest 0.1 mm. All proportions are based on standard length and all material is reported by standard length rounded to the nearest millimeter, except for the primary type material. All x-ray photographs are in data files maintained by the author. The acronyms used in the lists of materials to designate institutions and collections cited, follow general usage giv-

en in Leviton et al. (1985) and Eschmeyer (1998).

Apogon quartus, new species Figs. 1 & 2

Material examined.—Holotype: USNM 307688; (49.8); Indian Ocean, Saya de Malha Bank, 11°05'00"S, 62°02'00"E; *Vityaz* Cr. 17; Sta 2808; 8 Jan 1989; 58–61 m.; X-ray.

Comparative material.—*Amia albomarginata* Holotype: USNM 68402; (83.6); Philippines, Cavite; X-ray. *Apogon arafurae* Holotype: BMNH 1879.5.11.141; (90.0); Arafura Sea. *Apogon argyrogaster* Syntypes: ZMA 101075; (34.9–47.5); New Guinea, west coast; Siboga sta 164; 32 m. BPBM 32628; (15.5–48.3); New Guinea, Nagada Harbor; 18 Nov 1987; 30 m; X-ray. *Apogon bilaciniatus* Lectotype: ZMA 101280; (46.2); Indonesia, Lombok. *Apogon ellioti* Paralectotype?; ZSI 1905; (77.7, 96.0 mm TL); India, Madras; X-ray. Paralectotype?; AMS B.8226; (77.3, 98.1 mm TL); India, Madras; X-ray. *Apogon fuscovatus* Holotype: WAM P14397; (94); Australia, Darwin; 4 Sep 1965. Paratypes: WAM P14516–17; (83–85); Australia, N. of Darwin; 9 Sep 1965. WAM P 28316-001; (66); Australia, Darwin; 10 Sep 1965. *Apogon glaga* Syntype: RMNH 5614 (71.9, ~93 mm TL); Indonesia. *Apogon hungi* Neotype: USNM 340009; (76.4); Mozambique Channel. *Jaydia hungi* Holotype: MNHN 1965-711 (94.3); Egypt, Gulf of Suez. *Apogon lineatus* Lectotype: RMNH 70a; (62.4); Japan. USNM 71240; (64.6); Japan, Shimizu Suruga; Albatross; 1906; female. USNM 32586; (56.3); China, 35°55'49"N, 120°21'29"E; 25 Jul 1993; female. *Amia melas* [= *Apogonichthys melanopterus*] Holotype: ANSP 47491; (~35.2 head distorted); Philippine Islands. *Apogon melanopus* WAM P 14963; (100); Australia, Darwin; 4 Sep 1965. *Apogon modestus* Holotype: RMNH 5579; (61.9); Indonesia, Java. *Apogon nigricans* Syntype: ZSI 1872; (55.0, 71+ TL) India, Madras; X-ray. *Apogon*

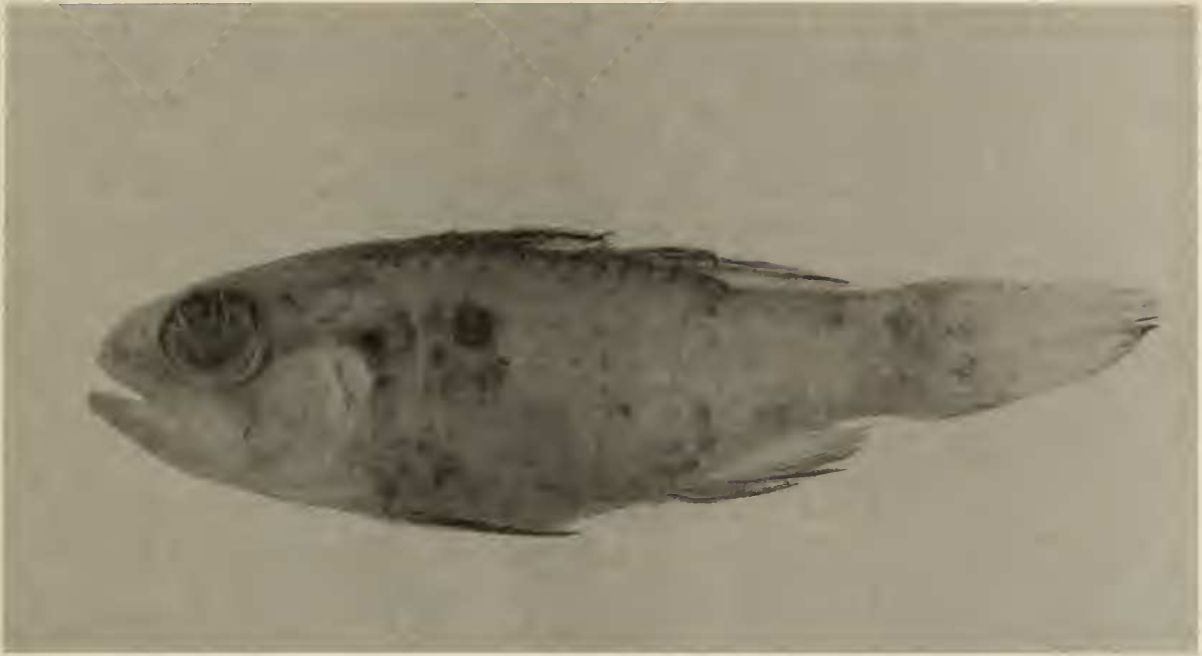


Fig. 1. The holotype of *Apogon quartus* from the Saya de Malha Bank, Indian Ocean, 49.8 mm SL.

gon novaeguineae Holotype: MNHN 8695; (56.5); New Guinea. *Apogon photogaster* Paratype: USNM 348214; (43.3); Papua New Guinea, Madang Lagoon; 21 Oct 1996; 18–23 m; X-ray. *Apogon poecilopterus* Holotype: RMNH 214; (79.0); Indonesia, Java. *Apogon queketti* Syntypes: SAM 11657; (75.1); South Africa, Natal; X-ray. SAM 11658; 5(44.1–77.4); same data; X-ray. *Jaydia smithi* Paratypes: ZMH 5034; 5(12.7–46.3); *Amia striata* Holotype: USNM 68403; (67.2); Philippines, Luzon; female; X-ray. Paratypes: USNM 93410; 11(39.2–66.2); same data; X-ray. Somalia, Gulf of Aden; X-ray. *Apogon striatodes* Holotype: USNM 213408; (55.5); Indian Ocean, Thailand. Paratypes: China, Hong Kong: CAS 160877; (57); CAS 161015; (55). Philippines, Luzon: CAS 85669; (45); Corregidor I.: CAS 32723 (46). Thailand, Gulf of Thailand: CAS 79648; (36–37); CAS 79652; (44); (CAS 82205; 8(18–59); CAS 85676; (26–30); CAS 85666; 3(28–34); CAS 85667; (19); CAS 82202; (17–47); CAS 82208; (54). *Apogon tchefouensis* Paratypes: MNHN 1941-148; (45.7); China, Shandong Prov., Tch -Fou, Ho Ting Chieh; X-ray. MNHN 1941-149; (35.0); same data; X-ray. *Apogon truncatus* Holotype: RMNH 5582; (55.4); Indonesia, Batavia (=Jakarta).

Apogon hoevenii Syntype: RMNH 5581; (40.2, 50 mm TL, one of 6 spec. in size range, 24 spec. 25–49 mm SL); Indonesia, Ambon. USNM 261058; 8(35–39); Philippines, Siquoijor I. *Apogon* sp. USNM 349199; (48.8); Philippines, Palawan, Puerto Princesa City.

Diagnosis.—A species of *Apogon* in the subgenus *Jaydia* with 15 pectoral rays, generally smooth to crenulate preopercle edge, one predorsal scale, 18 total (13 well developed) gill rakers on the first arch, fourth dorsal spine the longest, and a single dark spot, perhaps appearing as an ocellus in life, on the body just behind the opercle flap.

Description.—For general body shape see Fig. 1. Proportions (as percentage of standard length): greatest body depth 33.5; head length 42.2; eye diameter 11.4; snout length 9.2; bony interorbital width 10.2; upper-jaw length 20.5; caudal-peduncle depth 14.8; caudal-peduncle length 21.5; first dorsal-spine length 3.4; second dorsal-spine length 9.0; third dorsal-spine length 15.7; fourth dorsal-spine length 17.9; spine in second dorsal fin 14.8; first-anal-spine length 2.4; second-anal-spine length 11.4; pectoral-fin length 21.2; pelvic-fin length 21.2.

Dorsal fin VII–I,9; anal fin II,8; pectoral

fin 15–15; pelvic fin 1,5; principal caudal rays 9 + 8; number of simple pored lateral-line scales unknown, series extending from posterior edge of posttemporal to caudal fin; transverse scale rows above lateral line 2; transverse scale rows below lateral line ~4; median predorsal scales 1, the lateralis system extending well onto the nape as a raised semi-translucent fleshy area of about seven striations or rows with many small papillae; number of circumpeduncular scale rows unknown; total gill rakers 18, well developed 13, 3+2 upper arch, 11+2 lower arch.

Villiform teeth in wide band on premaxilla; wide band grading to two rows on dentary; one to two rows on palatine and one to three rows on vomer; none on ectopterygoid, endopterygoid or basihyal.

Vertebrae 10 + 14. Five free hypurals, one pair of slender uroneurals, three epurals, a free parhypural. Three supraneurals, two supernumerary spines on first dorsal pterygiophore. Basisphenoid present. Supramaxilla absent. Posttemporal smooth on posterior margin. Preopercular ridge smooth, posterior vertical edge smooth, ventral horizontal edge slightly crenulate with one or two spinelets at angle. Infra-orbital with irregular edges, but without serrations. Scales ctenoid. Caudal fin slightly rounded. Nose and pre-interorbital area semi-translucent and slightly bulbous. No indication of bean-like bioluminescent organs associated with intestine near anus.

Life colors.—Unknown.

Preserved color pattern.—In 70% ethyl alcohol: peritoneum pale, stomach and intestine pale. Dark mark from ventral margin of eye ending near posterior edge of premaxilla, two dark lines from posterior margin of eye, upper to posttemporal, lower onto opercle ending in a ventrally directed, short mark; dark spot ocellus-like on side just behind opercle flap, with about five smaller spots positioned anteriorly and ventrally close to large spot; other melanophores on pectoral-fin base and abdomen, scattered diffuse spots on caudal peduncle

behind second dorsal and above anal fin; scales above the lateral-line scales outlined with melanophores; lower third of snout dusky between upper jaw and eye; pelvic fins with spine and distal third of rays dark to tips; anal fin with dark band on spines and first three fin-rays to tip, fourth fin-ray mostly dark, distal third of next two fin-rays dark, last two fin-rays pale from base to tips; caudal fin with tips of rays dark; second dorsal-fin spine and first four fin-rays dark to tips, remaining fin-rays pale; first dorsal fin with the anterior four spines and membranes dark to their tips, remaining spines and membranes pale.

Distribution.—Known from the Indian Ocean on the Saya de Malha Bank (Fig. 2).

Etymology.—The Latin word for fourth, *quartus* in reference to the longest dorsal spine.

Remarks.—The fourth dorsal spine is the longest dorsal spine in this specimen. With additional characters including a high number of pectoral-fin rays, rounded caudal fin and preserved color pattern, this species can be placed within the broad limits of subgenus *Jaydia* revised by Gon (1996). *Apogon quartus* is the first species of this subgenus to be found on the extensive isolated shallow banks the Central Indian Ocean. Most of the species treated by Gon (1996) have a continental distribution pattern. Only a few specimens of *Apogon hungi* Fourmanior & Nhu-Nhung, 1965, and *Apogon smithi* (Kotthaus, 1970) have been reported from insular localities (Gon, 1996).

Apogon quartus appears to be most closely related to *Apogon poecilopterus* Cuvier in Cuvier & Valenciennes, 1828, *Apogon carinatus* Cuvier in Cuvier & Valenciennes, 1828, and *Apogon queketti* Gilchrist, 1903. The new species differs from *A. queketti* and *A. carinatus* by not having an ocellus in either dorsal fin. *A. poecilopterus* has more predorsal scales (4–5) and a darkish gill chamber. The ocellus-like spot on the body is unique to *A. quartus* among these species.

Apogon argyrogaster is unique among

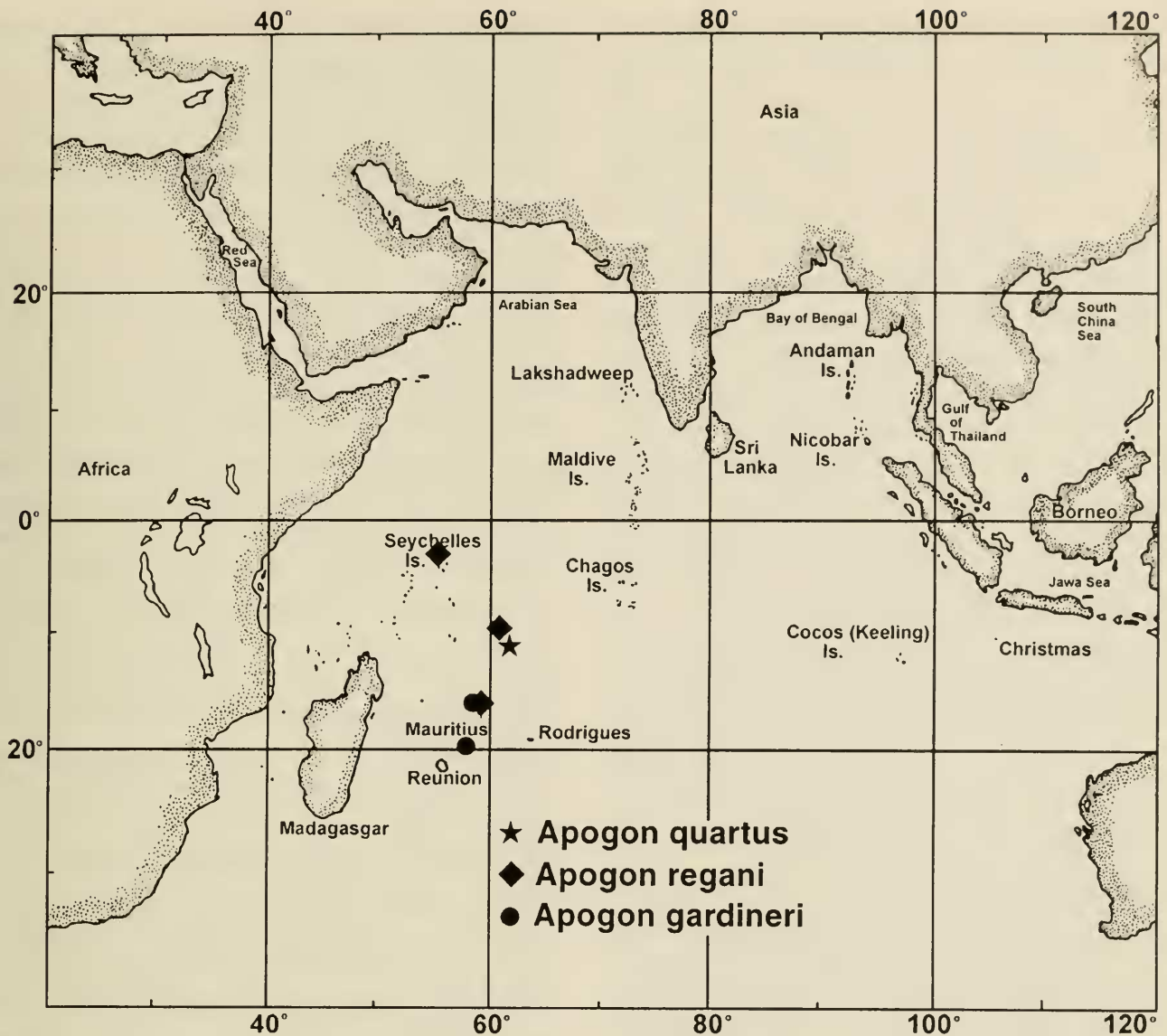


Fig. 2. Distribution of collection sites for *Apogon quartus*, *Apogon gardineri*, and *Apogon regani*.

species of *Apogon* with its large ventral organs (probably bioluminescent) extending on each side of the body from the breast area forward into the lower part of the mouth and backward to past the origin of the anal fin. Gon & Allen (1998) recently described *Apogon photogaster* with an externally similar bioluminescent system to *A. argyrogaster* but made no comparisons. Their name appears to be a synonym of *A. argyrogaster*. They placed *A. photogaster* in *Jaydia*. *Apogon argyrogaster* has faint bars on the side of its body, two predorsal scales, 8–9 well developed gill rakers in addition to the luminous organs. All are characters differing from *A. quartus*.

Apogon melanopus, with nine anal rays

and an emarginate caudal fin unlike all other *Jaydia* species, is a member of *Jaydia* with the fourth dorsal spine the longest and 16–17 pectoral-fin rays. This species was described by Allen (1985) as *A. fuscovatus*. Allen & Morrison (1996) later synonymized Allen's species when describing another new species, *A. fuscomaculatus*, which they compared with *Apogon striatus* (Smith & Radcliffe in Radcliffe 1912). *Apogon melanopus* and *A. fuscomaculatus* differ in having higher well-developed gill rakers (15–16) and lower well-developed gill rakers (8–9) respectively and general color pattern (no ocellus-like spot in either species) from *A. quartus*.

Paratypes of *A. tchefouensis* from the

East China Sea examined by me have no discernable color patterns because of the strong brown stain on both specimens. Fang (1942) described the color in alcohol as "... uniformément brun-noirâtre." Fang (1942) described the preopercle as "Bord libre du préopercule nettement denticulé avec des dents assez fortes surtout à son angle, mais plus fines à la partie supérieure du bord postérieur." The condition of the preopercle with a smooth ridge and prominent serrations, stronger at the angle and finer ones on the posterior edge and ventral edge, suggest a different group, probably type B (but serrations more like type A on edges) of Gon's categories than with the group (type C) containing *A. quartus*. The posttemporal is serrated. Total gill raker and rudiment count on the first gill arch is 18, well-developed rakers 14 (3+2 on upper arch, 12+1 on lower arch) of the larger paratype. The smaller paratype is in poor shape and has a badly damaged head. The pectoral ray count was 15 on one side of both paratypes and 14 for the other side for the larger paratype. Palatine teeth are in one to two short rows for the larger paratype. Palatine teeth of the lectotype of *Apogon lineatus* Temminck & Schlegel, 1842, are in 4 short rows like the holotype of *Apogon striatodes* Gon, 1996, (3–4 short rows), and the holotype *A. striatus* (3–4 short rows) but not *Apogon novaeguinae* Valenciennes, 1832 with one row. Additional information about the color of the peritoneum and intestine from the holotype and paratypes may help determine whether *A. tchefouensis* is a junior synonym of either *A. lineatus* or *A. striatus* or the senior synonym of *A. striatodes*. The known distribution of the two species recognized by Gon (1996) in the East China Sea region do not appear to overlap, but he suggests the possibility for Taiwan. If distributional patterns are accurate, then the larger paratype of *A. tchefouensis* should be identified as *A. lineatus*. Whatever the eventual status of *A. tchefouensis*, the paratypes can be distinguished

from *A. quartus* by having serrated preopercle and posttemporal.

Fowler & Bean (1930) compared *Apogonichthys melanopterus*, their replacement name for *Amia melas* Fowler, 1918, with *Apogon carinatus*. Fowler (1918) first related his new species to *Apogon nigricans* Day, 1875, a nominal species related to, if not the same as *Apogon melas* Bleeker, 1848, with a forked caudal fin, a trace of a dark spot on the midbase of the soft dorsal fin and darkish pelvic and vertical fins. In his original description, Fowler noted that the holotype of *Amia melas* has the fourth dorsal spine longer than the third. My observation of the holotype agrees with Fowler's statement. However, the third spine is noticeably stronger (thicker) than the fourth spine unlike other species of *Jaydia*. *Apogon melanopterus* is consistent in some other characters with *Jaydia*: gill-raker count (3+1–11+3), some serrations on the preopercle edge and a rounded? (damaged) caudal fin, but has 14 pectoral-fin rays versus the common 15–17, rarely 14 or 18 pectoral-fin rays of *Jaydia*. This species differs from *A. quartus* in preserved color pattern (no ocellus-like spot; dorsal, pelvic, anal and caudal fins all blackish), predorsal scales (3), strong third dorsal spine and 14 pectoral rays. I cannot with certainty place *A. melanopterus* within *Jaydia* as treated by Gon.

Relationships.—The basis for the proposed monophyly of *Jaydia* will need to be re-examined because some of Gon's (1996) diagnostic features are present in other species of *Apogon*. For example, *Apogon hoevenii* Bleeker, 1854d, a more 'typical' *Apogon* with an emarginate caudal fin, serrated preopercular edge and a low pectoral ray count (12), has the fourth dorsal spine variably as its longest. The holotype of *A. melanopterus* has the fourth dorsal spine as the longest and a robust thicker third dorsal spine. One undescribed species and a related species, *Apogon moluccensis* Valenciennes, 1832, have the fourth dorsal spine as the longest in nearly all adults but not in all

small individuals. The third spine in these two species is about as strong as the fourth spine, and both have forked caudal fins. The undescribed species has a darkish roof of the mouth and gill arches reminiscent of *A. poecilopterus*. An unidentified species of *Apogon*, either new or a juvenile of a species in the *Apogon diversus* (Smith & Radcliffe in Radcliffe, 1912) group, has strong serrations on the preopercular ridge and edges, serrated infraorbitals, a strongly forked caudal fin and fourth dorsal spine as the longest spine. Characters present in *A. melanopus* and the above species suggest that an expanded review is needed. A solid basis for the subgenus founded on the shape of the caudal fin, the length of the fourth dorsal spine, strength of the third dorsal spine, high pectoral-fin ray counts, supporting structures for the dorsal fin and other characters elucidated by Gon may grade with the examination of more species. Perhaps some of the other species of *Apogon* discussed here eventually may be shown to be closer to this species complex than to other *Apogon*. Those species treated by Gon that have bioluminescent systems are more likely to be monophyletic and may be worthy of the recognition as the subgenus *Jaydia*. There is, as yet, no clear resolution about whether these two subgenera represent monophyletic groupings within *Apogon*.

Status of *Apogon heraldi*

Fig. 3

Apogon heraldi (Herre, 1943) was described in *Mionurus*, a misspelling of *Mionorus* Krefft, 1868, as having nine anal rays. Herre compared it with two unrelated nominal species with six first dorsal spines, *Apogon bombonensis* (Herre, 1925) and *Apogon mydrus* (Jordan & Seale, 1905). There is enough information in Herre's description to determine that this species should be compared with those treated by Gon (1996), but not enough to place it with certainty. Herre did not give a figure of the type. A redescription of the type, with a fig-

ure is needed to provide comparison with the new species and with other related species.

Material examined.—*Mionurus heraldi* Holotype: SU 38263 (104.5); Philippines, Luzon I., Ragay Gulf, X-ray.

Comparative material.—See *A. quartus*.

Description.—For general body shape see Fig. 3, Range of proportions (as percentage of standard length): greatest body depth 39.4; head length 42.0; eye diameter 9.8; snout length 8.5; bony interorbital width 9.6; upper-jaw length 20.1; caudal-peduncle depth 16.7; caudal-peduncle length 20.2; first dorsal-spine length 2.4; second dorsal-spine length 7.1; third dorsal-spine length 10.9; fourth dorsal-spine length 14.1; spine in second dorsal fin 11.3; first anal-spine length 2.8; second anal-spine length 10.9; pectoral-fin length 25.4; pelvic-fin length 26.7.

Dorsal fin VII–I,9; anal fin II,8; pectoral fin 16–16; pelvic fin I,5; principal caudal rays 9 + 8; number of pored lateral-line scales unknown; number of transverse scale rows above lateral line unknown; number of transverse scale rows below lateral line unknown; median predorsal scales 4 or 5; number of circumpeduncular scale rows unknown. Gill rakers, upper arch 2 rudiments 1 well developed raker, lower arch 1 rudiment, 10 well-developed rakers, 11 well developed and 14 total.

Villiform teeth in single row anteriorly, slightly larger grading into wide band at sides of premaxilla; three rows anteriorly with one to two rows at sides of dentary, interior row slightly larger from anterior to side; one row on palatine; two rows on vomer; none on ectopterygoid, endopterygoid or basihyal.

Vertebrae 10 + 14. Five free hypurals, one pair of slender uroneurals, three epurals, a free parhypural. Three supraneurals, two supernumerary spines on first dorsal pterygiophore. Basisphenoid present. Supramaxilla absent. Posttemporal smooth on posterior margin. Preopercular ridge smooth, vertical margin smooth, horizontal



Fig. 3. The holotype of *Mionurus heraldi*, SU 38263, 104.5 mm SL from the Philippine Islands, Luzon I., Ragay Gulf.

margin with smooth undulations. Infraorbitals with crenulate to sharp edges. Scales ctenoid, many missing from body. Caudal fin slightly rounded. No indication of bean-like bioluminescent organs associated with intestine near anus.

Life colors.—Unknown.

Preserved color pattern.—In 70% ethyl alcohol: peritoneum silvery; intestine and stomach mostly pale with scattered melanophores; second dorsal fin with dark stripe near base, a narrow pale area above on first few rays to about fifth ray, more distally the fin-ray membranes dusky to dark with second narrow pale area, then fin rays dusky to tips; wide darkish stripe basally in anal fin, the membranes pale distally; spinous dorsal dusky distally, dark between the second and fifth spines, pale basally; pelvic and pectoral fins pale; gill chamber and gill arches dusky with melanophores; caudal fin membranes dusky with no indication of a darker margin.

Remarks.—*Apogon heraldi* has the fourth dorsal spine longest and can be grouped with Gon's type C preopercle pattern of *Jaydia*. Herre (1943) described the color of *A. heraldi* in alcohol as "... pale brown, with a more or less evident vertical dark-brown bar under each scale; there is a blackish spot on the upper half of the spinous dorsal, and a wide dark-brown cross-band on the second dorsal and the anal, which are otherwise clear; all but the basal part of the caudal is dusky; the pectorals and ventrals are clear". Herre's description of the teeth as "The very small conical teeth are in a single row in the lower jaw," and lack of comment about color in the oral cavity would suggest that this specimen is not *A. poecilopterus*. However, my re-examination of the holotype indicates that the dentition and the color pattern in the gill chamber are consistent with that of *A. poecilopterus*. The holotype has 14 gill rakers plus rudiments on the first gill arch, 2+1 on the upper arch and 10+1 on the lower arch, about 4 or 5 predorsal scales and 16 pectoral rays, all consistent with *A. poecilop-*

terus. Herre (1943) reported on material of *A. ellioti* [=truncatus] and *A. poecilopterus* from the Ragay Gulf and *A. striatus* from Manila Bay in the same paper. *Apogon heraldi* is considered a synonym of *A. poecilopterus*. The type is a ripe female.

Apogon gardineri Regan, 1908

Figs. 2 & 4

Material examined.—Holotype: BMNH 1908.3.23.93; 39.7 mm SL; Cargados Carajos; 55 m. Other material: BPBM 24775; (41–42); Mauritius, off Flic en Flac; J. E. Randall et al.; 7 April 1979; 57 m; color photo; x-ray.

Comparative material.—*Apogon nigripinnis* Syntype: MNHN 8694; 63.4 mm SL; India, Pondicherry; Leschenault. Mozambique: Delagoa Bay: RUSI 3149; (60–76); x-ray. RUSI 3151; (67); 1938; x-ray. RUSI 3148; 4(42–84); x-ray. RUSI 3150; 4(68–74); x-ray. Palma: RUSI 3152; (69); 1 Aug 1951; x-ray. Aldabra I.: RUSI 3153; (49–53); 14 Nov 1954; x-ray. *Apogon striatus* Syntypes: MNHN 1973-41; 3(16.8–26.2); Madagascar, Nosy-Bé; x-ray. *Apogon suezii* Holotype: MNHN 5137; (50.6); Egypt, Suez; Letourneux. *Apogon taeniatus* Syntypes: MNHN 8693; (55.3–57.4); Red Sea; Ehrenberg. Kenya: RUSI 3106; (85); Malindi; 2 Oct 1952; x-ray. RUSI 3111; (94); Shimoni; 1950; x-ray. RUSI 3107; (77–83); Shimoni; Nov 1952; x-ray. RUSI 3112; 3(15–66); Shimoni; May 1951; x-ray. RUSI 3109; (76); Feb 1952; x-ray. Mozambique: RUSI 3105; (79); Pinda reef; 1950; x-ray. RUSI 3114; (49); Mocimboa de Praia; 3 Sep 1951; x-ray. RUSI 3110; (81); Inhambane; Sep 1948; x-ray. RUSI 3108; 3(59–82) Jun 1950; x-ray. Aldabra: RUSI 3113; (55); Nov. 1954; x-ray. ANSP 63868; (86); South Africa. *Apogon thurstoni* Holotype: BMNH 1889.8.17.2; (55.5); India, Madras; Day. *Apogon timorensis* Holotype: RMNH 5583; (60.8); Timor. QM I.820; 3(23–31); Australia, Darnley I. QM I. 8506; (28); Australia, Queensland, Green I. *Apogonichthyoides fraxineus* Holotype: RUSI 356;

(57.7); Mozambique, Pinda Reef; 3 Sep 1956; x-ray. Paratypes (all x-rayed): Mozambique: RUSI 746; 8(42–65); Pinda Reef; 3 Sep 1956. RUSI 751; (67); Pinda Reef; Sep 1956. RUSI 762; (37–69); Pinda Reef; 23 Sep 1956. RUSI 758; (48–55); Delagoa Bay. RUSI 7409; (33); Ibo I.; Aug 1951. Zanzibar: RUSI 757; (41); 20 Sep 1952. RUSI 754; (54); 9 Sep 1952. RUSI 748; 3(52–57); 4 Sep 1952. RUSI 759; (23–24); Seychelles, Mahe I.; Sep 1954.

Diagnosis.—A species of the subgenus *Ostorhinchus* with two saddles on the body and one on the caudal peduncle, no cheek mark, a pale stomach, intestine and peritoneum, 14 pectoral-fin rays, 2 predorsal scales and 14–15 total gillrakers.

Description.—For general body shape see Fig. 4. Range of proportions (as percentages of standard lengths), holotype in parentheses: greatest body depth 38–39 (37.3); head length 42 (42.3); eye diameter 15 (13.8); snout length 8.8–9.5 (9.3); bony interorbital width 8.4–8.8 (8.6); upper-jaw length 18–20 (19.6); caudal-peduncle depth 14–16 (14.9); caudal-peduncle length 21–24 (19.4); first dorsal-spine length 3.0–3.6 (5.0); second dorsal-spine length 8.3–9.5 (9.3); third dorsal-spine length 19–20 (18.6); fourth dorsal-spine length 16–19 (18.6); spine in second dorsal fin 13–15 (13.8); first anal-spine length 3.1–4.1 (3.3); second anal-spine length 12–15 (11.8); pectoral-fin length 21–24 (20.1); pelvic-fin length 23–27 (23.4).

Dorsal fin VII–I,9; anal fin II,8; pectoral fin 14–14; pelvic fin I,5; principal caudal rays 9 + 8; simple pored lateral-line scales 24; transverse scale rows above lateral line 2; transverse scale rows below lateral line 5–6; median predorsal scales 2; circumduncular scale rows 12 (5+2+5). Total gillrakers 14–15 (14), well developed 9–10 (9), upper arch 2+1, lower arch 8–9+2–3 (8+3).

Villiform teeth in a wide band on the premaxilla and dentary; two rows on the palatine and vomer; none on ectopterygoid, endopterygoid or basihyal.

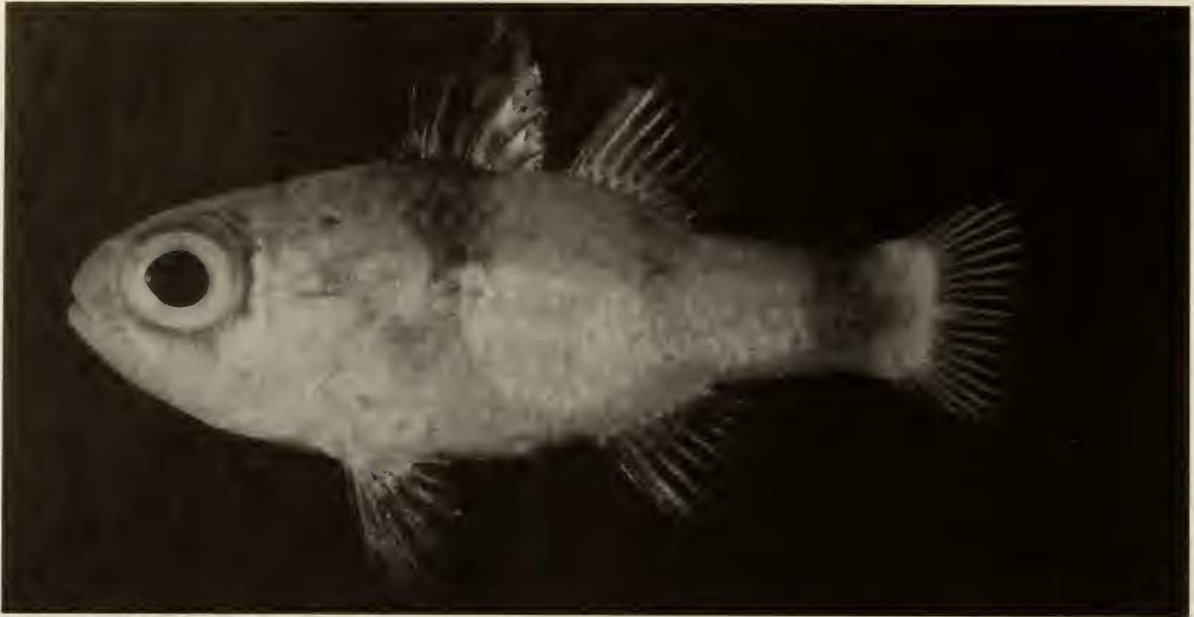


Fig. 4. *Apogon gardineri*, BPBM 24775, 42 mm SL, from Mauritius, off Flic en Flac by J. E. Randall.

Supramaxilla absent. Posttemporal smooth on posterior margin. Preopercle serrate on vertical and horizontal margins, smooth on ridge. Infraorbitals smooth, posterior ones with crenulations. Scales ctenoid. Caudal fin weakly emarginate.

Life colors.—Based on a Ektachrome transparency of the Mauritian specimen the color pattern is as follows: Iris yellow; head (without dark or pale spots, bars or stripes) and body with a light tannish background; a small brownish spot at the beginning of pored lateral-line scales; a darker brownish bar beginning at the base of first five dorsal spines and extending to about level of pectoral fin, as a chevron, angled posteriorly; a second fainter bar or blotch under last four or five soft rays of second dorsal fin reaching to or just below pored lateral line; a full dark brownish mark (spot or bar-like) on caudal peduncle; first dorsal fin with a dark brownish bar extending over first five spines and contiguous with bar on the body, membrane behind the fifth to seventh spines pale; second dorsal, anal and caudal fins pale without spots, bars or stripes; pelvic fin pale except for the last third of the first two soft rays.

Preserved color pattern.—In 70% ethyl alcohol: The holotype has no color remaining. Regan (1908) reported: “Faint traces

of 3 dark vertical bars, the first below the spinous dorsal, the second below the soft dorsal, the third on the caudal peduncle. Spinous dorsal blackish except posteriorly; ventrals blackish at the tips”. The Mauritian specimens have a pale intestine, with a few melanophores on the stomach, peritoneum pale; first dorsal fin dark, with a mark extending onto the body to about even with the pectoral fin; a second saddle extends downward from the posterior part of the second dorsal fin base; a diffuse blotch on the caudal peduncle; a faint cheek mark and a spot behind the eye.

Distribution.—Known only from the Mascarene Plateau.

Remarks.—Regan (1908) suggested that *A. gardineri* was related to *Apogon bandanensis* Bleeker, 1854a. *Apogon bandanensis* has more gill-raker (total gillrakers 25–29) and has black stomach and intestine. Smith (1961) synonymized *A. gardineri* with *Apogon nigripinnis* Cuvier in Cuvier & Valenciennes, 1828. The holotype of *A. nigripinnis* is a different species with 16 pectoral-fin rays, 16 total rudiments and gill rakers, 12 well-developed rakers (3+2 upper arch, 10+1 lower arch), two predorsal scales, a deeper body (depth 42.9% standard length), soft dorsal and anal fins blackish and a uniform brownish body without

an obvious ocellated spot on the side of the body (faded?) or basicaudal spot (faded?). The holotype of *Apogon thurstoni* Day, 1888, shares all of the above-listed characters of *A. nigripinnis*, 16 pectoral-fin rays, 16 total rudiments and gill rakers, two predorsal scales, a body depth of 43.4% of standard length, but has 10 well developed gill rakers (2+2 upper arch, 8+4 lower arch) and an obvious ocellated spot on side about midline. All of the Southern African material specimens here as *A. nigripinnis* have an ocellus on the side, but otherwise have meristics and body depth similar to the type: 15–16 pectoral-fin rays, 16–18 total rudiments and gill rakers, 11–12 well-developed rakers (2–3+2 upper arch, 9–10+1–4 lower arch), two predorsal scales, a body depth of 42–48% of standard length.

Apogon taeniatus Cuvier in Cuvier & Valenciennes, 1828, appears closely related to *A. nigripinnis* and may also be confused with *A. gardineri*. However, *A. taeniatus* variably has an ocellated spot within the first dorsal saddle above the pectoral fin, a small basicaudal spot, faint stripes on body, 16–19 total rudiments plus gill rakers, 9–12 well-developed rakers (2–4+1–2 upper arch, 8–10+3–5 lower arch), 14–15 pectoral-fin rays, 3 predorsal scales and a greater body depth of 40–45% standard length. The holotype of *Apogon suezii* Sauvage, 1883, shares with *A. taeniatus* an ocellated spot above the pectoral fin, 17 total rudiments and gill rakers, 12 well-developed rakers (2+2 upper arch, 10+3 lower arch), 15 pectoral-fin rays, three predorsal scales and a body depth of 40.9% standard length, but it has a small basicaudal spot within a darkish bar.

The low gill-raker count, body shape and color pattern of *A. gardineri* may cause some confusion with *Apogon timorensis* Bleeker, 1854b and two of its synonyms *Apogon fraxineus* (Smith, 1961) and *Apogon striatus* Fourmanior & Crosnier, 1964, which differs in having a thin, dark cheek line from the eye onto the preopercle, a black stomach and intestine, 15–17, usually

16 pectoral rays and fewer developed (6–8) and more rudiments (4–7) on the lower arch. Fourmanior and Crosnier's name is an unavailable name as a secondary homonym of *Apogon striatus* (Radcliffe in Smith & Radcliffe, 1912).

Apogon gardineri is found in deeper water. It does not appear to have been reported from any of the shallow-water collections from Mauritius, Cargados Carajos or the Seychelles in the past several decades. Many of the species in this complex appear to have continental distributions, for example, Gon (1986, map 1). *Apogon gardineri* represents an insular species endemic to the Mascarene Plateau.

Apogon regani Whitley, 1951

Figs. 2 & 5

Synonyms: *Apogon punctatus* Regan, 1908, preoccupied by *Apogon punctatus* Klunzinger, 1880.

Material examined.—Syntypes: *Apogon punctatus* BMNH 1908.3.23.86–89; 4(31.9–65.4); Cargados Carajos; 39–55 m. Other material: BPBM 35475; (45); Seychelles, N. of Aride I., 4°10'S, 55°44'E; R/V *Tyro*, Station 714, 2.4-m *Agassiz* trawl; J. van der Land et al.; 19 Dec 1992; 55 m, color photo; USNM 307706; (44); Indian Ocean, Saya de Malha Bank, 10°16'00"S, 61°09'00"E; Vityaz Cr. 17; Sta 2810; 8 Jan 1989; 50–70 m; x-ray.

Comparative material.—See *A. gardineri*.

Diagnosis.—A species of *Apogon* in the subgenus *Ostorhinchus* with 15–17 pectoral rays, 4–6 rows of small spots on the body, pale stomach, intestine and peritoneum and 14–16 total gill rakers.

Description.—For general body shape see Fig. 5. Range of proportions (as percentages of standard lengths, syntypes in parentheses): greatest body depth 44 (40.7–43.0); head length 37–42 (40.4–42.5); eye diameter 10–13 (10.8–12.5); snout length 10–11 (9.4–10.6); bony interorbital width 9.6–9.8 (8.7–9.7); upper-jaw length 23

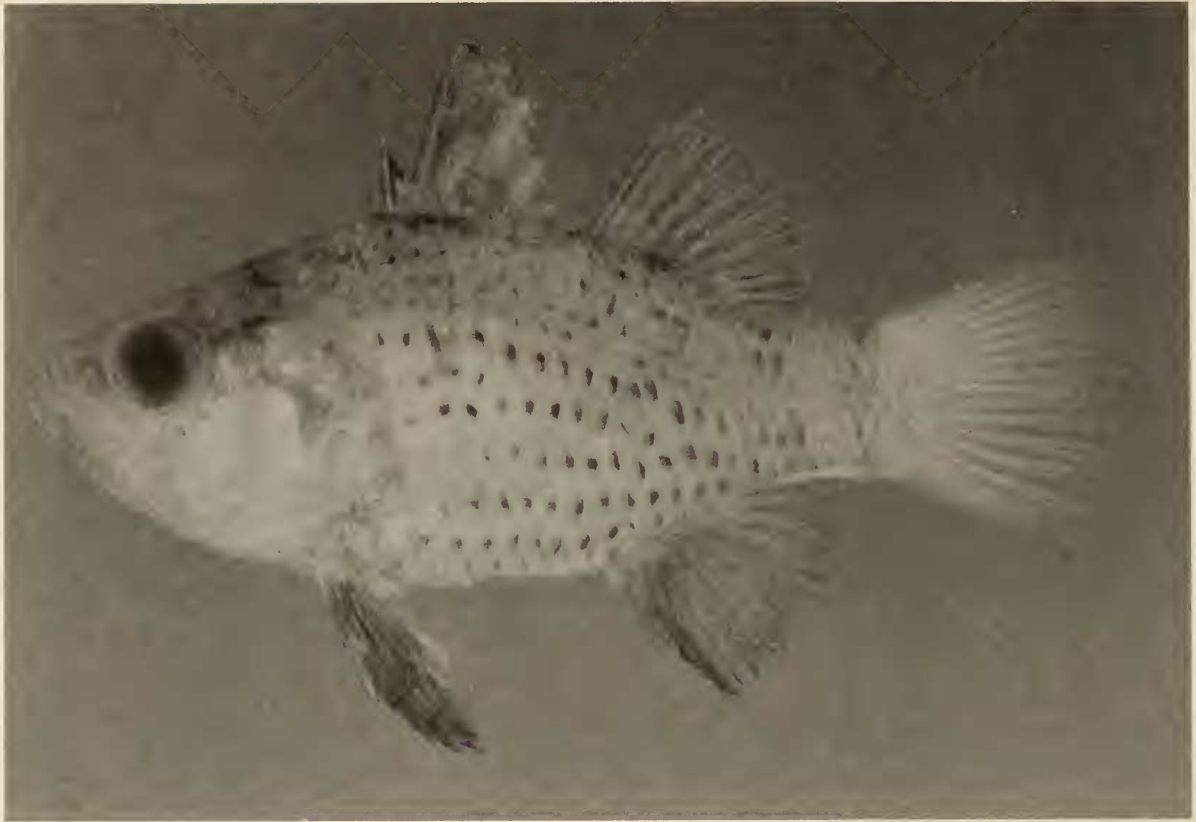


Fig. 5. *Apogon regani*, BPBM 35475, 45 mm SL, from the Seychelles, N. of Aride I. by J. E. Randall.

(20.8–22.6); caudal-peduncle depth 17–19 (15.9–17.0); caudal-peduncle length 20–22 (18.5–20.8); first dorsal-spine length 3.7–3.9 (3.0–4.1); second dorsal-spine length 10 (6.6–8.1); third dorsal-spine length 22–23 (18.5–21.6); fourth dorsal-spine length 20–22 (17.9–20.3); spine in second dorsal fin 16–18 (13.3–14.5); first anal-spine length 4.1–5.0 (3.0–4.1); second anal-spine length 15–16 (12.0–13.3); pectoral-fin length 21–23 (21.9); pelvic-fin length 29–33 (25.7–27.7).

Dorsal fin VII–I,9; anal fin II,8; pectoral fin 15–15, 15–16, 16–16, or 17–17; pelvic fin I,5; principal caudal rays 9 + 8; pored lateral-line scales 24–25; transverse scale rows above lateral line 2; transverse scale rows below lateral line 6–7; median predorsal scales 2–3; circumpeduncular scale rows 12(5+2+5). Total gillrakers 14–16, well-developed 10–11, upper arch 2+2 and lower arch 8–9+1–3.

Villiform teeth in a band on the premaxilla, the outer row slightly larger; several rows anteriorly, two rows on side of the

dentary; one to two rows on the palatine, two rows on vomer; none on ectopterygoid, endopterygoid or basihyal.

Vertebrae 10 + 14. Five free hypurals, one pair of slender uroneurals, three epurals, a free parhypural. Three supraneurals, two supernumerary spines on first dorsal pterygiophore. Basisphenoid present. Supramaxilla absent. Posttemporal serrate on posterior margin. Preopercle serrate on vertical and horizontal margins, smooth on the ridge. Infraorbitals smooth, the second crenulate and third with a single spine. Scales ctenoid. Caudal fin truncate.

Life colors.—Based on an Ektachrome transparency of the Seychelles specimen the color pattern is as follows: Iris pale; head and body with a pale tannish background on the upper parts; a dark brown oblique line behind the eye; head silvery below eye level; body silvery below the pored lateral line on body to about the end of anal-fin base, faint brownish spots on some, but not all scales above the pored lateral line; larger brownish spots on each scale below the

pored lateral line, forming about five lines of spots, reducing to two lines on the anterior portion of the caudal peduncle; a brownish area on the dorsum below the first four or five spines; another mark on dorsum below the fifth soft dorsal ray; caudal and pectoral fins pale; first dorsal dusky and whitish with a spot near the base of the fourth to sixth spines; second dorsal fin dusky; anal fin with a dark brownish edge to the second anal spine and first soft ray, the rest of fin dusky, pelvic fins dark brownish except the fifth soft ray pale.

Preserved color pattern.—In 70% ethyl alcohol: the syntypes with three to four rows of small spots below the lateral line on side of body. The pelvic fins and second dorsal fin blackish. Stomach, intestine and peritoneum pale. The other two specimens with six rows of small spots on side of body to caudal peduncle, one row above the lateral line; three marks behind eye, a narrow oblique cheek mark, a mark between the eye and preopercle just below the mid-line of the head, and an oblique mark past the top of the preopercle; all vertical fins darkish, caudal fin pale.

Distribution.—Known only from the Mascarene Plateau.

Remarks.—Whitley (1951) created the replacement name, *A. regani* for *A. punctatus* Regan, 1908, which is preoccupied by *Apogon punctatus* Klunzinger, 1880, a primary homonym. Klunzinger's species is presently placed in *Vincentia*, a mostly warm temperate species group from Australia and Tasmania. According to the International Commission on Zoological Nomenclature (1985: Art 59b) Regan's homonym is to be treated as permanently rejected.

Regan suggested a relationship with *A. nigripinnis*. Smith (1961) synonymized *A. punctatus* with *A. nigripinnis*. However, *A. regani* differs from all known species in the *A. nigripinnis* group by the presence of small spots, one per scale, on the body. *A. regani* represents an insular species in this group.

This species is found in deeper water. Randall & Egmond (1994) reported *A. regani* as *A. punctatus* from the Seychelles and provided a color photograph without description. It does not appear to have been reported from any of the shallow-water collections from Mauritius or Cargados Carajos in the past several decades. *Apogon regani* represents the second insular species endemic to the Mascarene Plateau in the *A. nigripinnis* complex.

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